ZooKeys 117: 73–81 (2011)
doi: 10.3897/zookeys.117.1328
www.zookeys.org

RESEARCH ARTICLE

A peer-reviewed open-access journal
ZooKeys
Launched to accelerate biodiversity research

Preliminary list of horse flies (Diptera, Tabanidae) of Serbia

Stjepan Krčmar

Department of Biology, J.J. Strossmayer University of Osijek, Trg Lj. Gaja 6, HR-31000 Osijek, Croatia

Corresponding author: *Stjepan Krčmar* (stjepan@biologija.unios.hr)

Academic editor: *Torsten Dikow* | Received 31 March 2011 | Accepted 30 June 2011 | Published 8 July 2011

Citation: Krčmar S (2011) Preliminary list of horse flies (Diptera: Tabanidae) of Serbia. ZooKeys 117: 73–82. doi: 10.3897/zookeys.117.1328

Abstract

Thirty six species of horse flies (Tabanidae) were previously known from Serbia (Europe). The present faunistic study of horse flies (Tabanidae) has resulted in the recording of the 4 new species *Atylotus fulvus* (Meigen, 1804); *Tabanus miki* Brauer in Brauer and Bergenstamm, 1880; *Tabanus unifasciatus* Loew, 1858; and *Heptatoma pellucens* (Fabricius, 1776), in the fauna of Serbia. The genus *Heptatoma* Meigen, 1803 is cited for the first time in the fauna of Serbia. 40 species are currently known from Serbia, belonging to nine genera. The fauna can be considered relatively poorly studied. Most of the species belong to the Boreal-Eurasian type of fauna 23, followed by the South European group with 8 species, the Mediterranean group with 6 species, European group with 2 species and Central European group with 1 species.

Keywords

Tabanidae, Diptera, Serbia, Europe

Introduction

The Tabanidae family contains over 4,000 described species found throughout the world (Chainey 1993). The females are known as mechanical vectors of viruses, bacteria, protozoans and helminths that cause various diseases in wild and domestic animals (Foil 1989, Desquesnes and Dia 2004). Therefore, during the last thirty years numerous studies into the effectiveness of synthetic and natural attractants in the sampling of horse flies have been carried out around the world (French and Kline 1989, Phelps and

Copyright *Stjepan Krčmar*. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Holloway 1992, Hribar et al. 1992, Hayes et al. 1993, Leprince et al. 1994, Krčmar et al. 2005, 2006, Krčmar 2007, Mihok et al. 2007, Cilek and Olson 2008, Mihok and Mulye 2010). Moreover, in this period a few new traps for collecting horse flies have been made (Hribar et al. 1991, Cilek and Medrano 2000, Mihok 2002, Dia et al. 2004, Mihok et al. 2006). However, there are some regions in the world that have not yet been sufficiently studied, one of these regions is the Balkan Peninsula. The horsefly fauna is poorly known in Central Balkan countries, 40 species were recorded in Macedonia, 42 species in Montenegro and 36 species in Serbia (Strobl 1898, 1900, 1902, Doflein 1921, Leclercq 1959, 1960a, 1960b, 1965, 1966, 1968, Coe 1958, 1960, Moucha 1959, 1965, Moucha and Chvála 1964, Majer 1985, Krčmar et al. 2002, Zeegers 2005, www.faunaeur.org). At the beginning of the twentieth century there were a few sporadic visits by foreign entomologists to Central Balkan countries, during which time several species of horse flies were collected. Most horse flies in the Central Balkan countries were collected after the Second World War, during the sixties and during the study tour of Czech and Belgian entomologists in the countries of Southeastern Europe. During my visits to Serbia in 2004 and 2006, I collected a few interesting species of horse flies, which led me to summarize all available data on the horsefly fauna of Serbia. Because of this, this work is based on literature findings and data obtained from a faunal survey conducted in the summer of 2004 and during the spring and summer months of 2006.

Material and methods

Samplings of horse flies in Serbia were carried out during 2004 and 2006 mostly in the area of the Fruška Gora national park. In this period, horse flies were collected at 8 localities. The Fruška Gora national park is an isolated, narrow, mainland mountain in the Pannonian plain. Most of the mountain lies in Vojvodina, Serbia except for a small section to the west which lies in Croatia. To the north, the mountain is bordered by the Danube. Lengthwise, it is approximately 80 km east to west and 15 km north to south (45° 10' 0" N, 19° 40' 0" E). Its highest peak is Crveni Čot at 539 m (http://en.wikipedia.org). Its location, specific geological history and different microclimatic conditions make it very interesting and important to science. Thanks to the unique and very rich deposits of fossil fauna and flora, Fruška Gora is called the mirror of the geological past. The main characteristic of this region is the existence of numerous protected, rare and endangered species (http://www.npfruskagora.co.rs). The horse flies were collected on 25 June 2004, 24 July 2004, 20 May 2006, 24 July 2006, and 10 August 2006 from horses by hand and by means of a sampling net when horse flies flew into a car. All collected horse flies were preserved in ethanol. Identification and nomenclature followed that of Chvála et al. (1972), Chvála (1988) and Mally (1987). Also, the presence of some species was determined upon a review of literature data. The full scientific names for all species including the author and year is only provided in the updated list of Serbian Tabanidae and is omitted from the text below.

Results of the study at Fruška Gora

All together 542 specimens were collected (Table 1) belonging to 24 species of horse flies grouped into the subfamilies Chrysopsinae and Tabaninae and the genera: *Chrysops*, *Atylotus*, *Hybomitra*, *Tabanus*, *Heptatoma* and *Haematopota*. Four species: *Tabanus glaucopis*, *Tabanus exclusus*, *Haematopota pluvialis*, and *Tabanus tergestinus* made up 81% of the fauna of horse flies in the researched area, while 19% were representatives of other species (Table 1). The most numerous genus is *Tabanus* with 11 species, followed by *Haematopota* with 4 species, *Atylotus* and *Hybomitra* with 3 species, *Chrysops* with 2 species and *Heptatoma* with 1 species (Table 1). From the collected sample, 4 species of horse flies new to the fauna of Serbia were determined, these are *Atylotus fulvus*, *Tabanus miki*, *Tabanus unifasciatus*, and *Heptatoma pellucens*. Four females of the species *Atylotus fulvus* were collected in Letenka on 24 July 2006. One female of the species *Tabanus miki* was collected in Brankovac on 24 July 2006. The third new species *Tabanus unifasciatus* was collected in Brankovac on 24 July 2006 (1♀), and 10 August 2006 (3♀), while two females were collected at the locality in Zmajevac on

Table 1. Species and numbers of horse flies collected in Serbia during 2004 and 2006.

Species	No. of Specimens	%
Tabanus glaucopis	231	42.61
Tabanus exclusus	98	18.08
Haematopota pluvialis	63	11.62
Tabanus tergestinus	45	8.30
Haematopota bigoti	26	4.79
Tabanus bromius	19	3.50
Tabanus sudeticus	14	2.58
Hybomitra ciureai	12	2.21
Tabanus unifasciatus	6	1.10
Tabanus autumnalis	4	0.73
Atylotus rusticus	4	0.73
Atylotus fulvus	4	0.73
Tabanus maculicornis	2	0.36
Atylotus loewianus	2	0.36
Chrysops caecutiens	2	0.36
Haematopota italica	2	0.36
Chrysops viduatus	1	0.18
Hybomitra bimaculata	1	0.18
Hybomitra solstitialis	1	0.18
Tabanus bovinus	1	0.18
Tabanus cordiger	1	0.18
Tabanus miki	1	0.18
Heptatoma pellucens	1	0.18
Haematopota pandazisi	1	0.18
Total: 24	542	

10 August 2006. Finally, the fourth species is *Heptatoma pellucens* that was collected at Brankovac on 10 August 2006. Thanks to the kindness of Dr. Th. Zeegers and the data he provided for this manuscript four additional horse fly species are added to the Serbian fauna: *Therioplectes tunicatus*, *Hybomitra aterrima*, *Hybomitra micans* and *Dasyrhamphis umbrinus*. Two females of *Hybomitra aterrima* were collected at the locality in Kopaonik, Jankova Bara on 11 June 2009 (Th. Zeegers unpublished data through personal communication). Also, one female specimen of *T. miki* was collected at the locality in Kopaonik, Lisina on 12 June 2009 (Th. Zeegers unpublished data through personal communication). Most of the species belong to the Boreal-Eurasian type of fauna (n= 23), (Olsufjev 1977). These species are: *Chrysops caecutiens*, *C. relictus*, *C. rufipes*, *C. viduatus*, *Atylotus fulvus*, *A. rusticus*, *Hybomitra aterrima*, *H. bimaculata*, *H. ciureai*, *H. distinguenda*, *H. muehlfeldi*, *Tabanus autumnalis*, *T. bovinus*, *T. bromius*, *T. cordiger*, *T. glaucopis*, *T. maculicornis*, *T. miki*, *T. sudeticus*, *Heptatoma pellucens*, *Haematopota italica*, *Hae. pluvialis*, and *Hae. subcylindrica*. The following 6 are Mediterranean species: *C. flavipes*, *Th. tunicatus*, *T. promesogaeus*, *T. exclusus*, *T. lunatus*, and *Philipomyia graeca* (Olsufjev 1977, Chvála et al. 1972). Furthermore, the following 8 are Southern European species: *A. loewianus*, *T. quatuornotatus*, *T. tergestinus*, *T. unifasciatus*, *Hae. bigoti*, *Hae. ocelligera*, *Hae. pandazisi*, *D. umbrinus* (Olsufjev 1977, Chvála et al. 1972). Only, *Hybomitra micans*, and *H. pilosa* belong to the group of European species (Chvála et al. 1972), while *Therioplectes gigas* belong to Central European group of species (Zeegers 2005).

The following list of species includes all available literature records and new records based on the study at Fruška Gora and previously unpublished records provided by Dr. Theo Zeegers.

List of Tabanidae species recorded in Serbia.

Subfamily Chrysopsinae
Genus *Chrysops* Meigen, 1803

1. *Chrysops caecutiens* (Linnaeus, 1758)
2. *Chrysops flavipes* Meigen, 1804
3. *Chrysops relictus* Meigen, 1820
4. *Chrysops rufipes* Meigen, 1820
5. *Chrysops viduatus* (Fabricius, 1794)

Subfamily Tabaninae
Genus *Atylotus* Osten – Sacken, 1876

6. *Atylotus fulvus* (Meigen, 1804)
7. *Atylotus loewianus* (Villeneuve, 1920)

8. *Atylotus rusticus* (Linné, 1767)

Genus *Therioplectes* Zeller, 1842

9. *Therioplectes gigas* (Herbst, 1787)
10. *Therioplectes tunicatus* Szilády, 1927

Genus *Hybomitra* Enderlein, 1922

11. *Hybomitra aterrima* (Meigen, 1820)
12. *Hybomitra bimaculata* (Macquart, 1826)
13. *Hybomitra ciureai* (Séguy, 1937)
14. *Hybomitra distinguenda* (Verrall, 1909)
15. *Hybomitra micans* (Meigen, 1804)
16. *Hybomitra muehlfeldi* (Bauer *in* Brauer and Bergenstamm, 1880)
17. *Hybomitra pilosa* (Loew, 1858)

Genus *Tabanus* Linnaeus, 1758

18. *Tabanus autumnalis* Linnaeus, 1761
19. *Tabanus bovinus* Linnaeus, 1758
20. *Tabanus bromius* Linnaeus, 1758
21. *Tabanus cordiger* Meigen, 1820
22. *Tabanus exlusus* Pandellé, 1883
23. *Tabanus glaucopis* Meigen, 1820
24. *Tabanus lunatus* Fabricius, 1794
25. *Tabanus maculicornis* Zetterstedt, 1842
26. *Tabanus miki* Brauer *in* Brauer and Bergenstamm, 1880
27. *Tabanus promesogaeus* Mally, 1987
28. *Tabanus quatuornotatus* Meigen, 1820
29. *Tabanus sudeticus* Zeller, 1842
30. *Tabanus tergestinus* Egger, 1859
31. *Tabanus unifasciatus* Loew, 1858

Genus *Heptatoma* Meigen, 1803

32. *Heptatoma pellucens* (Fabricius, 1776)

Genus *Haematopota* Meigen, 1803

33. *Haematopota bigoti* Gobert, 1880
34. *Haematopota italica* Meigen, 1804
35. *Haematopota ocelligera* (Kröber, 1922)
36. *Haematopota pandazisi* (Kröber, 1936)
37. *Haematopota pluvialis* (Linnaeus, 1758)
38. *Haematopota subcylindrica* Pandellé, 1883

Genus *Philipomyia* Olsufjev, 1964

39. *Philipomyia graeca* (Fabricius, 1794)

Genus *Dasyrhamphis* Enderlein, 1922

40. *Dasyrhamphis umbrinus* (Meigen, 1820)

Discussion

A previous list of Tabanidae of Serbia was based on literature data from previous studies (Strobl 1900, 1902, Coe 1958, 1960, Moucha 1959, 1965, Moucha and Chvála 1964, Leclercq 1966, 1968, Krčmar et al. 2002, Zeegers 2005, www.faunaeur.org). According to these studies 36 species were mentioned from Serbia. Four species were recorded as new for the fauna of Serbia during this study; two of them belong to genus *Tabanus*, followed by the genera *Atylotus* and *Heptatoma* with one species. All new species for the fauna of Serbia were collected during field work. New species were mainly collected on the localities of the Fruška Gora national park. The analysis of the recorded species during the 2004 and 2006 study resulted in a very high percent of Mediterranean species *T. exclusus* in localities of Fruška Gora. *T. exclusus* was represented with 18% in the collected sample indicating different microclimatic conditions. Interesting data for comparison with this high percent of records of *T. exclusus* in Fruška Gora is that this species in the Mediterranean part of Croatia was the most common with 21% (Krčmar 1999). Furthermore, very few specimens of *T. exclusus* were collected on the southern slopes of the mountain massifs of Dilj, Krndija and Papuk in the continental part of Eastern Croatia (Krčmar and Mikuska 2001). The distribution of this species belong to the area of Southern Europe and South Eastern Europe (Chvála et al. 1972). All these comparisons confirmed that Fruška Gora is very interesting and important for faunistical studies. Only Strobl (1900) and Moucha (1959) mentioned the presence of species *C. relictus* in Serbia but gave no other data except the name of country where the horse flies were collected, which they marked as "Serbia". Also, there are no exact data about the dates of collection, for the species *Th. gigas* and *T. lunatus* (Strobl 1902, Moucha 1959). However, two years ago on 8 June 2009 one female of the species *Th. gigas* was collected on Stara Planina 35 km ENE of Pirot (Th. Zeegers unpublished data through personal communication). The Tabanidae fauna of Serbia is very poor compared with neighboring countries (e.g., Croatia 78 species, Bosnia and Herzegovina 62 species). The most recent published article about Tabanidae fauna of Serbia was from the 1960s, where all the records were summarized as horse flies from Yugoslavia. The 40 determined species of horse flies indicate the necessity to continue with faunistical research, because this is certainly not the final number of horse flies in Serbia, the occurrence of many additional species is expected.

Acknowledgments

I thank to Dr. Theo Zeegers and the second anonymous reviewer for all improvements in this manuscript.

References

Chvála M (1988) Family Tabanidae. In: Soós Á (Eds) Catalogue of Palaearctic Diptera Athericidae – Asilidae. Akadémiai kiadó, Budapest, 97–171.

Chvála M, Lyneborg L, Moucha J (1972) The horse flies of Europe (Diptera, Tabanidae). Entomological Society of Copenhagen, Copenhagen, 499 pp.

Chainey JE (1993) Horse–flies, deer-flies and clegs (Tabanidae). In: Lane PR, Crosskey RW (Eds) Medical Insects and Arachnids. Chapman & Hall, London, 706 pp.

Cilek JE, Medrano G (2000) Public perception of a trap to locally reduce yellow fly (Diptera: Tabanidae) nuisance in residential areas of northeastern Florida. Florida Entomologist 83: 26–30. doi:10.2307/3496224

Cilek JE, Olson MA (2008) Effects of carbon dioxide, an octenol/phenol mixture, and their combination on Tabanidae (Diptera) collections from French two-tier box traps. Journal of Medical Entomology 45: 638–642. doi: 10.1603/0022-2585(2008)45[638:EOCDAP]2.0.CO;2

Coe RL (1958) Diptera taken in Jugoslavia from May to July, 1955 with localities and notes. Bulletin du Museum d' Histoire Naturelle de Belgrade, Série B 12: 181–206.

Coe RL (1960) A futrher collection of Diptera from Jugoslavia, with localities and notes. Bulletin du Museum d' Histoire Naturelle de Belgrade, Série B 16: 43–67.

Desquesnes M, Dia ML (2004) Mechanical transmission of *Trypanosoma vivax* in cattle by the African tabanid *Atylotus fuscipes*. Veterinary Parasitology 119: 9–19. doi:10.1016/j.vetpar.2003.10.015

Dia ML, Desquesnes M, Elsen P, Lancelot R, Acapovi G (2004) Evaluation of a new trap for tabanids and stomoxyines. Bulletin de la Societe Royale Belge d' Entomologie 140: 72–81.

Doflein F (1921) Mazedonien. Erlebnisse und Beobachtungen eines Naturforschers im gefolge des deutschen Heeres. Verlag von Gustav Fischer, Jena, 592 pp.

Foil LD (1989) Tabanids as vectors of disease agents. Parasitology Today 5: 88–96. doi:10.1016/0169-4758(89)90009-4

French FE, Kline DL (1989) 1-octen-3-ol, an effective attractant for Tabanidae (Diptera). Journal of Medical Entomology 26: 459–461.

Hayes RO, Doane OW, Jr, Sakolsky G, Berrick S (1993) Evaluation of attractants in traps for greenhead fly (Diptera: Tabanidae) collections on a Cape Cod, Massachusetts, salt marsh. Journal of the American Mosquito Control Association 9: 436–440.

Hribar LJ, LePrince DJ, Foil LD (1991) Design for a canopy trap for collecting horse flies (Diptera: Tabanidae). Journal of the American Mosquito Control Association 7: 657–659.

Hribar LJ, LePrince DJ, Foil LD (1992) Ammonia as an attractant for adult *Hybomitra lasiophthalma* (Diptera: Tabanidae). Journal of Medical Entomology 29: 346–348.

Krčmar S (1999) Horse flies in the Mediterranean part of Croatia (Diptera: Tabanidae). Folia Entomologica Hungarica 60: 325–344.

Krčmar S (2007) Responses of Tabanidae (Diptera) to canopy traps baited with 4 -methylphenol, 3-isopropylphenol, and naphthalene. Journal of Vector Ecology 32: 188–192. doi:10.3376/1081-1710(2007)32[188:ROTDTC]2.0.CO;2

Krčmar S, Mikuska J (2001) The horse flies of Eastern Croatia (Diptera: Tabanidae). Anali Zavoda za znanstveni i umjetnički rad u Osijeku 17: 91–146.

Krčmar S, Mikuska J, Chvála M (2002) Tabanidae (Diptera) of Western and Central Balkans – Bosnia and Herzegovina, Serbia, Montenegro, Vojvodina, Kosovo and Macedonia. Acta Universitatis Carolinae Biologica 46: 305–320.

Krčmar S, Hribar LJ, Kopi M (2005) Response of Tabanidae (Diptera) to natural and synthetic olfactory attractants. Journal of Vector Ecology 30: 133–136.

Krčmar S, Mikuska A, Merdić E (2006) Response of Tabanidae (Diptera) to different natural attractants. Journal of Vector Ecology 31: 262–265. doi:10.3376/1081-1710(2006)31[262:ROTDTD]2.0.CO;2

Leclercq M (1959) Tabanidae (Diptera) de Yougoslavie. Fragmenta Balcanica 2: 181–184.

Leclercq M (1960a) Révision systématique et biogéographique des Tabanidae paléarctique, 1: Pangoniinae et Chrysopsinae. Mémoires Institute royale Scientiarum Naturalium Belgique 63: 1–77.

Leclercq M (1960b) Tabanidae (Diptera) de Yugoslavie, II. Fragmenta Balcanica 3: 183–188.

Leclercq M (1965) Tabanidae (Diptera) des Balkans et de Sicile. Bulletin de l' Institute agronomique et des stations de recherces de Gembloux 33: 128–131.

Leclercq M (1966) Révision systématique et biogéographique des Tabanidae (Diptera) paléarctiques, 2: Tabaninae. Institut Royal des sciences naturelles de Belgique, mémories, deuxiéme série. Bruxelles, 237 pp.

Leclercq M (1968) Tabanidae (Diptera) des Balkans. Entomologische Berichten 28: 21–23.

LePrince DJ, Hribar LJ, Foil LD (1994) Responses of Horse flies (Diptera: Tabanidae) to Jersey bullocks and canopy traps baited with ammonia, octenol and carbon dioxide. Journal of Medical Entomology 31: 729–731.

Majer J (1985) New data on the Tabanidae (Diptera) fauna of Yugoslavia. Acta entomologica Jugoslavica 21: 5–7.

Mally M (1987) Glaucops Szilády, 1923, eine Untergattung des Genus Tabanus Linné, 1758 – Tabanus promesogaeus nom.n. für Tabanus mesogaeus Peus, 1980 (Diptera, Tabanidae). Entomofauna, Zeitschrift für Entomologie 8: 257–265.

Mihok S (2002) The development of a multipurpose trap (the Nzi) for tsetse and other biting flies. Bulletin of Entomological Research 92: 385–403.

Mihok S, Mulye H (2010) Responses of tabanids to Nzi traps baited with octenol, cow urine and phenols in Canada. Medical and Veterinary Entomology 24: 266–272.

Mihok S, Carlson DA, Ndegwa PN (2007) Tsetse and other biting fly responses to Nzi traps. Medical and Veterinary Entomology 13: 386–392.

Mihok S, Carlson DA, Krafsur ES, Foil LD (2006) Performance of the Nzi and other traps for biting flies in North America. Bulletin of Entomological Research 96: 387–397.

Moucha J (1959) Zur Kenntnis der Tabaniden Fauna Yugoslawiens (Diptera, Tabanidae). Acta Faunistica Entomologica Musei Nationalis Pragae 5: 17–28.

Moucha J (1965) Zur Kenntnis der Tabaniden Fauna Jugoslawiens 2 (Ditera, Tabanidae). Acta Faunistica Entomologica Musei Nationalis Pragae 11: 71- 78.

Moucha J, Chvála M (1964) Notes on the genus *Therioplectes* Zeller, 1842 (Diptera, Tabanidae). Acta societatis entomologicae Cechosloveniae 61: 100–105.

Olsufjev NG (1977) Tabanidae, Fauna USSR. Nauka. Leningrad, 434 pp.
Phelps RJ, Holloway MTP (1992) Catches of Tabanidae in response to visual and odour attractants in Zimbabwe. Journal of African Zoology 106: 371–380.
Strobl G (1898) Fauna Diptera Bosne, Hercegovine i Dalmacije. Glasnik Zemaljskog Muzeja Bosne i Hercegovine 10: 387–393.
Strobl G (1900) Dipterenfauna von Bosnien, Herzegovina und Dalmatien. Wissechaftlichen Mittheilungen aus Bosnien und Herzegovine 7: 555–557.
Strobl G (1902) Novi prilozi fauni Diptera Balkanskog poluostrva. Glasnik Zemaljskog Muzeja Bosne i Hercegovine 14: 461–465.
Zeegers T (2005) Taxonomy and distribution of the horsefly-genus *Therioplectes* Zeller (Diptera: Tabanidae). Studia dipterologica 12: 337–355.
Fauna Europaea, URL: http://www.faunaeur.org [accessed 16 June 2011]
Fruška Gora - Wikipedia, URL: http://en.wikipedia.org [accessed 12 February 2011]
Nacionalni park Fruška Gora, URL: http://www.npfruskagora.co.rs [accessed 12 February 2011]